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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/016,439	12/11/2001	Todd P. Lukanc	039153-0447 (G1152)	5257

7590

10/03/2003

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EXAMINER

BARRECA, NICOLE M

ART UNIT

PAPER NUMBER

1756

DATE MAILED: 10/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/016,439

Applicant(s)

LUKANC ET AL.

Examiner

Nicole M. Barreca

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1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 21 and 22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 1-22 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-20, drawn to a method for defining a mask, classified in class 430, subclass 5.
 - II. Claims 21-22, drawn to an integrated circuit, classified in class 257, subclass 213.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process, such as exposure by laser pattern generation (i.e. without a photomask). Since the claims directed to the integrated circuit are written in product-by-process form, the product may be made by any process. See MPEP 2113.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Paul Hunter on 9/23/03 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-20. Affirmation of this election must be made by applicant in replying to this Office action.

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Claims 21-22 are withdrawn from further consideration by the examiner, 37

CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

6. The disclosure is objected to because of the following informalities: the specification refers to related pending applications (p.1, 5), without identifying the application serial numbers. Assuming that these application numbers have now been assigned, the examiner asks that they please be provided in response to this action.

Claim Rejections - 35 USC § 102

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Liebmann discloses a phase shift design mask system. The method may be used to design bright field phase shifted masks. Features 1 on the chip that require a phase-shifted portion of the mask are located (critical regions) and designed by edges 2. Phase-shifted regions 3 on opposite sides of the features are created on the mask. Proper phase termination of the phase regions are ensured and the phase are determined for the phase-shifted regions. A residual phase edge removal design is then derived (col.3, 56-col.4, 3, col.5, 51-63). Critical dimension chrome features are bordered by a 90° phase region on one side and a 270° phase region on the other side. The background of the mask is left at 0° phase (col.6, 8-1). A light field mask includes opaque chrome features in a clear background. The phase shift design includes designing areas within the general mask background that will need to have a phase assigned to them. The edges are then projected outward (col7, 41-46). A phase shift mask using 0° and 180° phase shift regions with either a separate trim mask or intermediate phase steps to erase residual phase edges may also be formed (col.9, 59-64, col.10, 1-25).

9. Claims 1-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Ludwig (US 6,543,045).

Ludwig discloses forming a phase shift mask. Critical regions are defined as having a distance between them less than a predefined minimum value. Individual sections of the polygons are assigned phases which have a phase difference of 180° .

Figure 8 illustrates a bright field mask 200 with non-transparent regions 21. Phase

transparent or critical regions 21. When straight sections of the non-transparent regions 21 end within a phase shifting element 22, an end region 23a is generated. End region 23b is generated at the point where a critical region 21 ends at a critical interaction region. Degenerated critical regions are then defined by removing overlapping regions 23 from non-transparent regions 21. The coherent regions that lie outside the phase-shifting regions and the critical regions are determined, along with the outer borders of the coherent regions, the overlapping regions and the end regions. The number of contact lines between the specific outer borders and the degenerated critical regions is determined and the phase conflict is determined if the number is uneven. The phase conflict is resolved by defining the region borders (boundary) and obtaining a set of connecting paths between pairs of parallel edges, opposite one another of respective polygons. The set of connecting paths is reduced and coverage regions are formed as region boundaries between two different regions of the phase mask to be manufactured such that the coverage regions have phase shifts with a phase difference of 180° degrees. A trim mask may be used for exposing the coverage regions. See col.4, 18-65, col.10,43-col.12, 11, col.15, 8-col.16, 34.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lukanc (US 6,534,224) discloses a phase shift mask. Le (US 5,686,208) discloses a method for generating a phase shifting mask. Mayhew (US 6,493,866) discloses a phase-shift lithography mapping method. WO 03/054626 discloses a method for enhancing clear field phase shift masks with border regions.

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11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 703-308-7968. The examiner can normally be reached on Monday-Thursday (8:00 am-6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Nicole Barreca
Patent Examiner
Art Unit 1756

9/24/03